

# इंटरनेट

# मानक

## Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 6489 (1993): Textiles - Woven fabrics - Determination of tear resistance by falling pendulum method [TXD 1: Physical Methods of Tests]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”



BLANK PAGE



भारतीय मानक

वस्त्रादि — बुने कपड़े — पाती पेन्डुलम पद्धति से विदरण  
प्रतिरोध ज्ञात करना

( पहला पुनरीक्षण )

*Indian Standard*

TEXTILES — WOVEN FABRICS — DETERMINATION  
OF TEAR RESISTANCE BY THE FALLING  
PENDULUM METHOD

*( First Revision )*

UDC 677'074 : 677'017'424'28

© BIS 1993

**BUREAU OF INDIAN STANDARDS**  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

## NATIONAL FOREWORD

This Indian Standard ( First Revision ) which is identical with ISO 9290 : 1990, issued by the International Organization for Standardization was adopted by the Bureau of Indian Standards on the recommendation of the Physical Methods of Tests Sectional Committee, ( TX 01 ) and approval of the Textile Division Council.

This standard was first published in 1971 and was based on ASTM Designation D 1424 : 63. With the publication of International Standard on the subject, it was decided to adopt it as an Indian Standard under dual number.

Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.

## CROSS REFERENCE

### *International Standard*

ISO 139 : 1973 Textiles — Standard atmospheres for conditioning and testing

### *Indian Standard*

IS 6359 : 1971 Method for conditioning of textiles

*Indian Standard*

**TEXTILES — WOVEN FABRICS — DETERMINATION  
OF TEAR RESISTANCE BY THE FALLING  
PENDULUM METHOD**

*( First Revision )*

## 1 Scope

This International Standard specifies a method for determining the force required to propagate a tear, through a specified distance and from a specified slit, cut in a test specimen of textile fabric, under specified conditions of loading. The test method is suitable for all types of woven fabric (treated and untreated). The method is not applicable to nonwovens or knitted fabrics. Two procedures are given for preparing test specimens.

## 2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 139:1973, *Textiles — Standard atmospheres for conditioning and testing*.

## 3 Definition

For the purposes of this International Standard, the following definition applies.

**tear resistance:** The average force, in newtons, required to tear a test specimen over a specified length.

## 4 Principle

A rectangular test specimen having a specified pre-cut slit is subjected to a tearing force generated by the energy stored in a pendulum-sector of specified

dimensions. The energy expended in tearing the specimen is used to determine the tear resistance of the specimen.

## 5 Apparatus

### 5.1 Elements of the apparatus

The apparatus essentially consists of a frame, mounted on a rigid base, carrying a pendulum and pointer assembly. It shall also satisfy the details as given below with respect to various parts.

**5.1.1 Pendulum,** preferably formed by a sector of a circle, suitably mounted, free to swing about a horizontal axis from bearings of very low frictional resistance.

**5.1.2 Augmenting mass,** the apparatus shall have provision of augmenting masses that may be attached to the pendulum sector for further increasing the working capacity of the apparatus.

**5.1.3 Jaws:** a pair of jaws each  $16 \text{ mm} \pm 0,5 \text{ mm}$  deep and  $37 \text{ mm} \pm 0,5 \text{ mm}$  wide, one stationary jaw, fixed with respect to the base, and the other movable jaw, fixed with respect to the pendulum. When the pendulum is in the initial position, ready for the test, the jaws shall be separated by a distance of  $2,8 \text{ mm} \pm 0,4 \text{ mm}$  and so aligned that the test sample when clamped lies in a plane perpendicular to the plane of oscillation of the pendulum sector with the edges of the jaws gripping the test specimen in a horizontal line, a perpendicular to which through the axis of suspension of the pendulum sector is  $104 \text{ mm} \pm 1 \text{ mm}$  long. The angle made by this imaginary line and the vertical shall be  $27,5^\circ \pm 5^\circ$ .

**5.1.4 Pendulum-sector release mechanism,** for holding the pendulum-sector in a raised position, and for releasing it without imparting shock.

**5.1.5 Pointer and pointer-stop**, for registering the maximum arc through which the pendulum-sector swings when released: The pointer is mounted on the same axis as the pendulum-sector, there being constant friction just sufficient to stop the pointer at the highest point reached by the swing of the pendulum-sector. The adjustable pointer-stop provides a means for setting the zero of the apparatus.

**5.1.6 Levelling screws**, for levelling the apparatus.

**5.1.7 Cutting die** (specimen size), having essentially the shape and dimensions shown in figure 1. The die is used to cut out the basic rectangular test specimen that is  $100 \text{ mm} \pm 2 \text{ mm}$  long and  $63 \text{ mm} \pm 1 \text{ mm}$  wide, plus an additional 8 mm of fabric at the top edge of the specimen to ensure that the last portion of the fabric is torn (not ravelled) and 4 mm of fabric at the bottom edge as an aid to centring it in the jaws.

**5.1.8 Means of making a slit** of  $20 \text{ mm} \pm 0,5 \text{ mm}$  in the centre of the bottom edge of the specimen to initiate the tear. The slit may be cut by the cutting die (5.1.7) or, alternatively, the initial cut may be made by a knife (that is mounted on the apparatus) when the specimen is in place.

## 5.2 Capacity and accuracy.

The apparatus shall be of suitable capacity so that the tearing occurs between 20 % and 80 % of the full-scale force. It shall also meet the following requirements:

Scale error	< 1 %
Zero error	< 0,5 % of full scale load
Zero stability	< 1 % of full scale load
Pointer friction	< 3 and > 2 scale divisions
Pendulum friction	> 35 oscillations

## 5.3 Adjustment and maintenance.

The apparatus shall be maintained properly and adjusted regularly in accordance with the instructions of the manufacturer. A brief description of adjustment and maintenance of an apparatus functioning on the above principle is given in annex A.

## 6 Preparation of test specimens

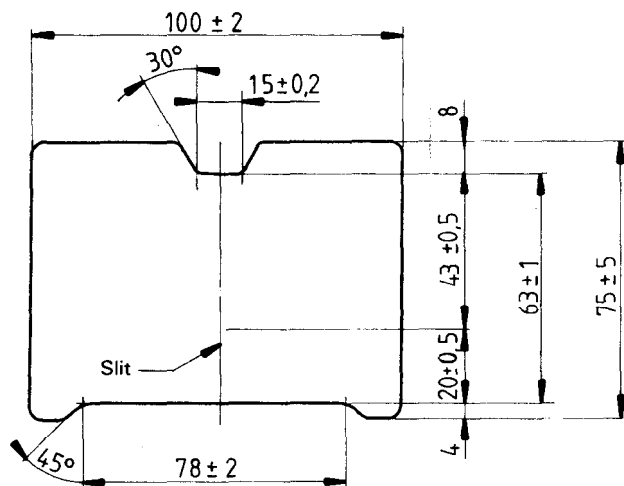
### 6.1 Sampling

The test sample shall be taken from a laboratory bulk sample that is representative of the lot to be tested. The test sample shall not be cut within 2 m of the ends of a piece nor closer than 50 mm to a selvage.

The critical dimensions of the test specimen are the distance of  $43 \text{ mm} \pm 0,5 \text{ mm}$  that is to be torn during the test, and the distance above the clamp of the end of the pre-cut slit of  $4,0 \text{ mm} \pm 0,5 \text{ mm}$ .

For method A, cut specimens as shown in figure 1. For method B, cut specimens  $100 \text{ mm} \pm 2 \text{ mm}$  by  $63 \text{ mm} \pm 1 \text{ mm}$ .

Dimensions in millimetres (unless otherwise stated) / Radii 3 mm



NOTE — For some apparatus the appropriate dimensions vary, particularly in the width of the test specimen. If specimens with widths other than those specified are used, this shall be stated in the test report.

Figure 1 — Cutting die

## 6.2 Test specimens

One set of not less than five specimens shall be cut for each direction to be tested, using the cutting die (5.1.7). The set for the warp tear tests (i.e. tearing across the warp threads) shall have the shorter dimension parallel to the weft threads, and the set for weft tear tests (i.e. tearing across the weft threads) shall have the shorter dimension parallel to the warp threads. Each set of specimens shall be cut from the sample in such a manner that no two specimens in the set include the same threads. In preparing the specimens, care shall be taken to align the threads running in the short direction parallel to the die so that when the slit is cut, the subsequent tear will take place between these threads and not across them. This precaution is most important when testing bowed fabrics.

**NOTE 1** Where it is necessary to determine the results to within a given confidence interval of the mean, it is recommended that the number of test specimens be determined using ISO 2602:1980, *Statistical interpretation of test results — Estimation of the mean — Confidence interval*.

## 7 Atmosphere for conditioning and testing

The specimens shall be conditioned and testing shall be conducted in one of the standard atmospheres for conditioning and testing textiles, specified in ISO 139.

## 8 Procedure

### 8.1 Preparation of apparatus

**8.1.1** Before testing, level the apparatus with the levelling screws (5.1.6) and check both the equilibrium position of the pendulum-sector and the zero reading.

**8.1.2** Select the capacity of the apparatus (5.2) according to the fabric under test, so that the specimens tear between 20 % and 80 % of the full-scale value. Carry out a preliminary test, if necessary, to determine the appropriate range.

### 8.2 Test procedure for method A

**8.2.1** Raise the pendulum-sector (5.1.1) to the starting position, secure it by the pendulum-sector release mechanism (5.1.4), and set the pointer against its stop (5.1.5).

**8.2.2** Clamp a specimen securely in the jaws (5.1.3) so that it is centred with the bottom edge set against the stops and the upper edge parallel to the top of the jaws. Close the jaws by tightening the setting screws, using approximately the same tension on both. Where applicable operate the knife

(5.1.8) to make the initial slit in the lower edge of the specimen. The specimen shall lie free with its upper edge directed towards the pendulum-sector so as to ensure a shearing action.

**8.2.3** Depress the pendulum-sector release mechanism as far as it will go and hold it down until tearing is completed. (This is particularly important in order to prevent the pendulum stop from interfering with the initial swing of the pendulum-sector.) Catch the pendulum-sector by hand on the return swing without disturbing the position of the pointer.

**8.2.4** Record the position of the pointer as indicated by the nearest whole scale division for the capacity used.

**8.2.5** Repeat operations 8.2.1 to 8.2.4 on the remaining test specimens.

**8.2.6** Discard readings obtained when the specimen slips in the jaws or where tearing deviates beyond the base of the slit in such a way that the tear is not completed in the notch at the top of the specimen.

### 8.3 Test procedure for method B

Carry out the procedure generally as described in 8.2 but, after mounting the specimen on the apparatus, make a slit using the means provided (5.1.8).

## 9 Expression of results

**9.1** Record the tearing force in newtons.

**NOTE 2** Depending on the type of apparatus used, this may mean multiplying the scale reading obtained by an appropriate factor as specified by the manufacturer of the test apparatus.

**9.2** Calculate and record the average force, in newtons, required to tear the test specimens across

- the warp threads;
- the weft threads.

**9.3** If required, calculate the coefficients of variation of the results.

## 10 Test report

The test report shall include the following:

- a) that the test was conducted in accordance with this International Standard and the method used (A or B);
- b) the type of material tested;



- c) the number of readings in both warp and weft directions;
- d) the individual values and the average tearing force, in newtons, for each direction of tear and, if required, the coefficient of variation for each direction of tear;
- e) the number of tests rejected because of cross-wise tearing or for other reasons.

## **Annex A** (informative)

### **Adjustment and maintenance of the apparatus**

#### **A.1 General**

Follow the procedure described in clause A.2 to clause A.6 for each of the pendulum/additional-mass combinations used.

#### **A.2 Inspection**

Check the following items and make any necessary adjustments:

- a) check that the pendulum shaft (5.1.1) is not bent;
- b) check that the distance between clamps (5.1.3) is  $2,8 \text{ mm} \pm 0,4 \text{ mm}$  and that, when the pendulum is in its initial position, the clamps are aligned;
- c) check that the knife (5.1.8) fitting is secure, and that the cutting edge is sharp and undamaged (the blade should be situated midway between, and at right angles to, the top of the clamps);
- d) ensure that the pointer (5.1.5) is undamaged and is rigidly attached to the sleeve.

#### **A.3 Levelling**

**A.3.1** Mount the apparatus on a rigid bench; if possible, firmly attach it to the bench.

**A.3.2** With the pendulum clamp closed, adjust the apparatus with the help of the levelling screws (5.1.6) so that the pendulum hangs vertically and the index marks on the pendulum and base coincide. With the stop (5.1.5) depressed, displace the pendu-

lum slightly and, after it comes to rest, check that the index marks still coincide.

#### **A.4 Zero adjustment**

After levelling, operate the apparatus several times with the clamps empty and closed to ascertain whether the pointer registers zero. If zero is not registered, move the adjustable pointer stop.

#### **A.5 Pendulum friction**

**A.5.1** Make a reference mark on the stop mechanism (5.1.4) 25 mm to the right of the edge of the pendulum catch. Raise the sector to its initial position and set the pointer so that it does not meet the pointer stop when the apparatus is in operation.

**A.5.2** When the sector is released and the pendulum stop held down, the sector should make at least 35 complete oscillations before the edge of the sector which engages with the catch no longer passes to the left of the reference mark. Otherwise, clean, oil or adjust the bearing.

#### **A.6 Tearing length**

The tearing length shall be  $43,0 \text{ mm} \pm 0,5 \text{ mm}$ . If this is not the case, adjust the dimensions of the guillotine or template used.

**Standard Mark**

The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

## Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 1986* to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

### Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS

### Revision of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Handbook' and 'Standards Monthly Additions'. Comments on this Indian Standard may be sent to BIS giving the following reference:

Doc : No. TX 01 ( 0190 )

### Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

## BUREAU OF INDIAN STANDARDS

### Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 11002  
Telephones : 331 01 31, 331 13 75

Telegrams : Manaksanstha  
Common to all Offices )

### Regional Offices :

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg  
NEW DELHI 110002

### Telephone

{ 331 01 31  
{ 331 13 75

Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Maniktola  
CALCUTTA 700054

{ 37 84 99, 37 85 61  
{ 37 86 26, 37 86 62

Northern : SCO 445-446, Sector 35-C, CHANDIGARH 160036

{ 53 38 43, 53 16 40  
{ 53 23 84

Southern : C. I. T. Campus, IV Cross Road, MADRAS 600113

{ 235 02 16, 235 04 42  
{ 235 15 19, 235 23 15

Western : Manakalaya, E9 MIDC, Marol, Andheri ( East )  
BOMBAY 400093

{ 632 92 95, 632 78 58  
{ 632 78, 91, 632 78 92

Branch : AHMADABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE.  
FARIDABAD. GHAZIABAD, GUWAHATI. HYDERABAD. JAIPUR. KANPUR  
LUCKNOW. PATNA. THIRUVANANTHAPURAM.